

## WHAT IS CLAIMED IS:

## 1. A power amplifier device comprising:

a power amplifier (1) that operates with an operating power-supply voltage obtained from a first power-supply voltage;

5 an operating power-supply voltage detecting circuit (13) that detects one of said operating power-supply voltage and said first power-supply voltage to obtain a detected power-supply voltage value; and

an operating power-supply voltage supplying portion (2, 3, 4, 11, 12) that has a power estimation function of estimating an output power value to be outputted from said  
10 power amplifier as an estimative output power value and that supplies said power amplifier with said operating power-supply voltage determined on the basis of said estimative output power value and said detected power-supply voltage value.

2. The power amplifier device according to claim 1, wherein said operating power-supply voltage supplying portion comprises:

15 a battery (4) that outputs said first power-supply voltage ( $V_{dd1}$ );

a power-supply voltage converting portion (2) that is interposed between said battery and said power amplifier and that converts said first power-supply voltage to a second power-supply voltage ( $V_{dd2}$ ) that is lower than said first power-supply voltage;

a switch portion (3) that is interposed between said battery and said power  
20 amplifier in parallel with said power-supply voltage converting portion and that supplies said first power-supply voltage as a third power-supply voltage ( $V_{dd3}$ ), said third power-supply voltage being higher than said second power-supply voltage; and

a controller block (11) that has functions of controlling operations of said power-supply voltage converting portion and said switch portion, and that judges on the  
25 basis of said estimative output power value whether said power amplifier is in a first

period where said power amplifier performs a low power output operation or in a second period where said power amplifier performs a high power output operation, wherein, in said first period, said controller block supplies said second power-supply voltage obtained from said power-supply voltage converting portion as said operating  
5 power-supply voltage, and in said second period, said controller block supplies one of said second and third power-supply voltages as said operating power-supply voltage on the basis of said detected power-supply voltage value.

3. The power amplifier device according to claim 2, wherein  
said operating power-supply voltage detecting circuit includes a circuit that  
10 detects said operating power-supply voltage,  
and in said second period,  
when said detected power-supply voltage value is below a first threshold while said second power-supply voltage is being supplied as said operating power-supply voltage, said controller block supplies said third power-supply voltage in place of said  
15 second power-supply voltage as said operating power-supply voltage, and  
when said detected power-supply voltage value is above a second threshold higher than said first threshold while said third power-supply voltage is being supplied as said operating power-supply voltage, said controller block supplies said second power-supply voltage in place of said third power-supply voltage as said operating  
20 power-supply voltage.

4. The power amplifier device according to claim 2, wherein  
said operating power-supply voltage detecting circuit comprises a circuit that  
detects said first power-supply voltage,  
and in said second period,  
25 when said detected power-supply voltage value is lower than a given threshold,

said controller block supplies said third power-supply voltage as said operating power-supply voltage, and in other cases said controller block supplies said second power-supply voltage as said operating power-supply voltage.

5. The power amplifier device according to any of claims 2 to 4, wherein

5 said operating power-supply voltage supplying portion further comprises a storage (12) that stores a controlling power-supply voltage/power table (T12) that associates values of the output power of said power amplifier and values of a controlling power-supply voltage for said power amplifier,

and said controller block refers to said controlling power-supply voltage/power  
10 table in said storage to recognize said controlling power-supply voltage value corresponding to said estimative output power value, and judges whether said power amplifier is in said first period or said second period on the basis of a result of a comparison between said controlling power-supply voltage value and a given reference voltage.

15 6. A communication terminal device comprising:

a transmitter block (6) that generates a transmission signal;

a power amplifier (1) that is supplied with an operating power-supply voltage obtained from a first power-supply voltage outputted from a battery so as to operate to amplify transmission power of said transmission signal;

20 an operating power-supply voltage detecting circuit (13) that detects one of said operating power-supply voltage and said first power-supply voltage to obtain a detected power-supply voltage value; and

an operating power-supply voltage supplying portion (2, 3, 4, 11, 12) that controls said transmitter block and has a power estimation function of estimating an  
25 output power value to be outputted from said power amplifier as an estimative output

power value, and that supplies said power amplifier with said operating power-supply voltage based on said estimative output power value and said detected power-supply voltage value.

7. The communication terminal device according to claim 6, wherein

5       said transmitter block comprises a variable gain amplifier (6b), and said output power value of said power amplifier is determined on the basis of a gain of said variable gain amplifier and a power amplification ratio of said power amplifier, and

      said operating power-supply voltage supplying portion comprises a storage (12) that stores a gain controlling table (T12) that associates values of the output power of said  
10   power amplifier and values of a gain controlling voltage for said variable gain amplifier,

      and said operating power-supply voltage supplying portion refers to said gain controlling table in said storage to recognize said gain controlling voltage value corresponding to said estimative output power value and performs a gain controlling operation to control the gain of said variable gain amplifier on the basis of the gain  
15   controlling voltage value.

8. The communication terminal device according to claim 7, further comprising:

      a temperature sensor (14) that detects a device temperature of said communication terminal device, wherein

20       said operating power-supply voltage supplying portion refers to said gain controlling table in said storage and recognizes said gain controlling voltage value corresponding to said estimative output power value on the basis of a difference between said device temperature and a given reference device temperature.

9. The communication terminal device according to claim 7, further  
25   comprising:

a receiver block (9) that receives an external received signal, wherein

said operating power-supply voltage supplying portion is capable of recognizing a transmission frequency on the basis of an instruction defining the transmission frequency contained in said received signal, and said operating  
5 power-supply voltage supplying portion refers to said gain controlling table in said storage and recognizes said gain controlling voltage value corresponding to said estimative output power value on the basis of a difference between said transmission frequency and a given reference transmission frequency.

10 10. A method of controlling a power amplifier device having a power amplifier (1) that operates with an operating power-supply voltage obtained from a first power-supply voltage outputted from a battery, said method comprising the steps of:

(a) detecting one of said operating power-supply voltage and said first power-supply voltage to obtain a detected power-supply voltage value;

15 (b) estimating an output power value to be outputted from said power amplifier as an estimative output power value and judging whether said power amplifier performs a high power output operation or a low power output operation on the basis of said estimative output power value;

20 (c) when said step (b) judges that said power amplifier performs said low power output operation, supplying a voltage obtained by decreasing said first power-supply voltage as said operating power-supply voltage; and

(d) when said step (b) judges that said power amplifier performs said high power output operation, supplying, as said operating power-supply voltage, one of said first power-supply voltage and said voltage obtained by decreasing said first power-supply voltage, on the basis of said detected power-supply voltage value.